

ENGINEERING PROPOSAL
FOR
PORTABLE INFRARED COMMUNICATOR
MODEL D

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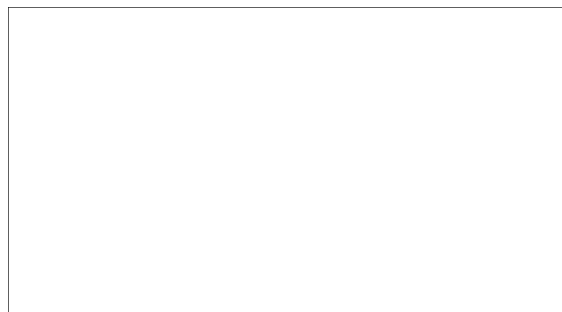
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MODEL D



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7 FEBRUARY 1956

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Section I. ENGINEERING OBJECTIVE

The objective of the program below is the production of a number of portable infrared communicators, Model D, identical to the first Model D unit as delivered 27 July 1955 except for slight modifications as detailed below.

These units are to have a range when used with a Model B as developed in this laboratory of 1 mile or more. They shall operate with a high degree of visual security. The specified range shall be achieved in either day or night operation. All operating procedures shall be simple and straightforward, with no special knowledge of electronics required of the operating personnel.

The size and shape of the Model D unit is such that one will fit in an ordinary, letter size briefcase.

Further objectives of this program are the production of operating manuals, manufacturing drawings, and specifications covering the Model D equipment.

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Section II. DESIGN

It is to be noted that the design of the Model D Communicator was fully accomplished in July of 1955, at which time the first unit was produced and delivered by this laboratory. This design however will be described below, including minor modifications which will be incorporated in these units.

1. Quantity.

A quantity of 14 Model D equipments will be produced.

2. Major Sections.

The Optical Section is housed in a case approximately 4-1/2 inches long by 3-1/4 inches wide by 7 inches high. It has a threaded socket for attachment to any photographic tripod. No tripod or other mounting or adjusting device will be furnished. A cable will connect the Optical Section to the Electrical Section. The Electrical Section is the larger of the sections which comprise the Model D equipment. This section is housed in a case approximately 9-1/2 inches long by 3-1/2 inches wide by 9 inches high, with the controls toward the center of the top adding to the 9 inch dimension.

3. Contents of Major Sections.

The Optical Section contains the beam lamp, the condenser system, the modulator (galvanometer) and the transmitter objective lens, as well as the modulator protective fuse all comprising the transmitter optics. It also contains the receiver optics consisting of the receiver objective lens and the lead sulfide detecting cell. A riflescope with an illuminated reticle may be mounted on the top of the Optical Section as used in the earlier Model B equipment. The possible addition of this scope is one of the modifications

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which is being considered over the original Model D unit. The original open sights furnished with Model D would then not be furnished.

Housed in the Electrical Section are the batteries, the battery charger, and the power supply as well as the electronic system which consists of the various amplifier and modulator circuits. The batteries, battery charger and power supply are precisely like those used in the Model B equipment, while the electronic system has been revised only by being rearranged to make possible the form factor required of the Model D equipment.

Another modification over the original Model D unit will be the addition of a connector in the cable circuit to allow the two major sections to be completely separated when desired. The riflescope would be arranged for removal from the Optic Section and be stowed under the pocket containing the Optic Section to maintain the overall size of the unit when carried in a brief case.

4. General Description.

In general, this equipment is very similar to the Model B Infrared Communicator except for the use of small refractive optics in place of the large reflective system there used, and the omission of the night viewer, the watertight case, the tripod table and the azimuth and elevation adjustments and calibration scales. Moreover, because the optics are so small, separate objective lenses are used to receive and transmit, in place of the single aperture used alternatively for these two functions in the Model B.

Thus the transmitter consists essentially of a microphone, a modulator amplifier, the galvanometer modulator, and a light source, a condensing lens

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system and an objective lens. An image of the lamp filament is focussed by the condenser lenses onto the mirror of the galvanometer. This mirror is vibrated through an angle of $\pm 14^{\circ}$ maximum by the amplified voice signal.

The approximately 60° cone of light leaving the galvanometer mirror is thus made to oscillate from full on the objective lens to full off, thus achieving 100% modulation of the light beam. The objective is masked off to a square aperture to minimize distortion. To assist in establishing communication, a built in oscillator may be used to modulate the galvanometer 100% at a frequency of about 900 cps.

The receiver consists essentially of an objective lens, a lead sulfide cell, an amplifier and a pair of light weight headphones of special frequency response. The response of the phones, the microphone and the transmitter and receiver amplifiers is so adjusted as to compensate for the deficiencies in the modulator and all responses and result in an overall pass band from about 500 cps to 3000 cps with a rising frequency characteristic which we have found highly desirable to maintain clear crisp speech near threshold levels and to minimize the effects of the $1/f$ noise output of the receiver cell.

5. Quality of Workmanship.

The Model D units will be built of highest quality commercial components and will be finished in a neat and workmanlike manner. Like the first Model D unit, the case design will be considerably simpler than that of Model B, and will not be waterproof or dripproof.

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Section III. OPERATING MANUAL

Five copies per unit, or a total of 70 copies of an operating and maintenance manual will be furnished. This manual will contain brief but adequate operating instructions. It will also contain field and repair base maintenance procedures in considerable detail. Field maintenance for the operator will be limited to such information as the changing of lamps, fuses, and batteries, while base maintenance will cover all other servicing on the entire equipment.

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Section IV. DRAWINGS

One reproducible set and five copies of full formalized drawings will be furnished to the same specifications as are being followed on the Model B formal drawings.

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Section V. SPECIFICATIONS

Full formal specifications, one reproducible and five positive copies, will be furnished to the same standards as are being followed on the formal Model B specifications.

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Section VI. SCHEDULE

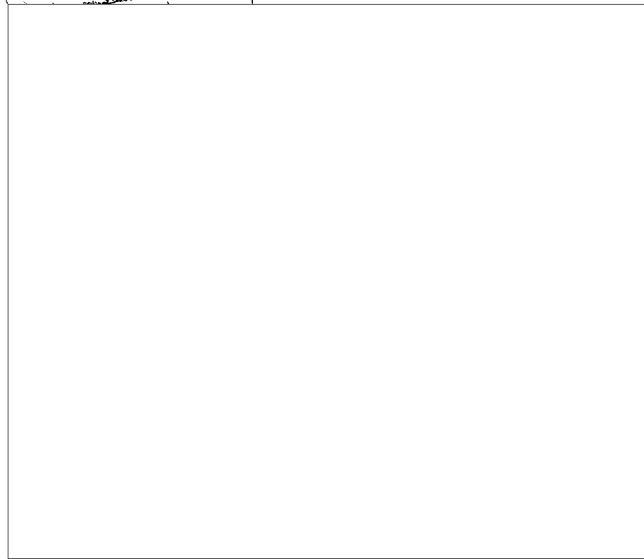
Delivery of the Model D units will start 5 months after receipt of contract and be complete within 60 days thereafter. Five operating manuals will be shipped with each Model D unit. Formal drawings and formal specifications will be delivered 10 months after receipt of contract.

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Prepared by:

Approved by:



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